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COSMETIC COMPOSITION DESIGNED TO PROTECT THE SKIN FROM THE SUN AND A PROCESS FOR ITS PRODUCTION

(57) Abstract:

(57) Abstract:

The present invention concerns a cosmetic composition designed to protect the skin from the sun, as well as a process for its production.

The cosmetic composition according to the invention is such that it contains mangostin.

The process according to the invention for producing said cosmetic composition is such that it consists essentially in extracting the mangostin-rich fraction from a part of a tree of the species *Garcinia mangostana*, solubilizing this fraction in an oily phase, and mixing this oily phase containing said fraction with an aqueous phase.

The present invention concerns a processs for producing a cosmetic composition designed to protect the skin from the sun. The invention also concerns such a cosmetic composition.

The harmful effects resulting from prolonged and repeated exposure to the sun for people who do not take special precautions have long been known. We can mention in particular the short-term effects like actinic erythema (commonly known as "sunburn") and longer-term effects consisting of premature aging of the skin, as well as diseases like cancer or skin conditions like keratosis.

To prevent these harmful effects as much as possible, various sun lotions or sunscreens have been developed. These sunscreens are essentially designed on the one hand to prevent premature aging of the skin due to type A ultraviolet radiation, and on the other hand to protect the skin from the actinic erythema resulting from type B ultraviolet radiation.

At the present time, more and more of these sunscreens are being incorporated into cosmetic compositions for habitual use, which may cause adverse effects in the consumer in certain cases. These effects are more or less

marked, depending on whether these sunscreens are synthetic or mineral in origin.

A major disadvantage of using synthetic sunscreens for cosmetic compositions is that these sunscreens have a tendency to penetrate deep into the epidermis, which increases the risk of intolerance to the cosmetic composition and may result in skin irritation reactions.

As for the use of sunscreens of mineral origin, their major disadvantage lies in the uncertain nature of the effectiveness of these sunscreens, which is highly dependent on the formulation of the cosmetic composition containing each sunscreen.

That is the reason why recent efforts have been directed toward finding natural sunscreens of plant origin which have a good protection factor independently of the compositions containing them and which minimize the risks of skin intolerance.

But the sun protection factors which have been obtained in *in vitro* tests on these compositions have not been satisfactorily confirmed by *in vivo* measurements, resulting in a certain lack of reliability for these cosmetic compositions.

The purpose of the present invention is to propose a process for producing a cosmetic composition designed to protect the skin from the sun, which is such that this composition has a high sun protection factor while remedying the disadvantages mentioned above.

For this purpose, said process consists essentially in extracting the mangostin-rich fraction from a part of a tree of the species *Garcinia mangostana*, solubilizing this fracti n in an oily phase, and mixing this oily phase containing said fraction with an aqueous phase.

According to one variant f embodiment, said process consists in using the fruit of said tree and, for example, the husk and dried stalks of said fruit to extract the mangostin-rich fraction from it.

According to another characteristic of the invention, said step of extracting the mangostin-rich fraction from said tree consists essentially in grinding said part of the tree, immersing it in a solvent designed to dissolve the mangostin which it contains, separating the mangostin dissolved in the solvent from said ground part, and evaporating the solvent so as to recover a dry mangostin extract.

Preferably, said extraction step also consists in precipitating said dry mangostin extract in an aqueous medium, and drying and grinding the precipitate obtained so as to obtain a powder further enriched in mangostin.

Preferably, said mangostin powder is present in said cosmetic composition at a weight fraction of about 10%.

As for the cosmetic composition according to the invention which is designed to protect the skin from the sun, it is characterized in that it contains mangostin.

The characteristics of the invention mentioned above, as well as others, will become clearer upon reading the following description of an example of embodiment.

The sunscreen according to the invention is based on mangostin, a natural substance belonging to the xanthone family.

This substance is extracted from a tree known by the common name of mangosteen, the species of which is identified as *Garcinia mangostana*. This tree is found in certain tropical countries and in the Southeast Asia region.

Preferably, this substance is extracted from the husk and dried stalks of

the fruit which is produced by this tree, a fruit which has the common name "mangosteen". But it is also possible to extract said substance from the pulp of the fruit, or even from other parts of the tree, such as the bark or the dried sap.

According to one example of embodiment of the invention, the mixture consisting of the husk and dried stalks of the mangosteen is first ground up.

Then this ground mixture is immersed in a solvent making it possible to extract the mangostin from this mixture. In this example of embodiment, the concentration of the ground mixture is 5 g per 100 mL of solvent. As a guideline, for example, ethanol or acetone can be used for the solvent, or any other organic solvent in which the mangostin can be dissolved.

Then the solution consisting of the ground mixture and the solvent is stirred to dissolve the mangostin in the solvent. Then a clarifying filtration of the solution is done, whereby the filtrate consists of the solvent and the mangostin dissolved in it. As for the filter cake, it consists of the ground mixture from which the mangostin has been removed by means of the solvent.

Preferably, the filter cake is then washed with the solvent and shaken up so as to extract the residual mangostin which is present from the cake. After a filtration step of the type described above, a second filtrate analogous to the above is obtained which consists of the solvent and the residual mangostin dissolved in it.

In this preferred example of embodiment, the second filtrate containing the residual mangostin is then added to the filtrate initially obtained, so that a solution of solvent which is rich in mangostin in the dissolved state is obtained.

The solvent in which the initially extracted mangostin and possibly the residual mangostin is dissolved, is eliminated by evaporation so as to leave only a dry mangostin extract.

The next purification step consists in again solubilizing the dry mangostin extract in a minimal quantity of solvent and adding demineralized water to obtain an aqueous suspension in the form of a precipitated deposit rich in mangostin.

As a guideline, 1.6 mL of solvent and 16.6 mL of demineralized water were added to the dry extract to carry out this extraction. These proportions correspond to the initial immersion mentioned above of 5 g of dried stalks and husks in 100 mL of solvent.

Then the precipitate is separated from the part of the dry extract which is poor in mangostin, by centrifuging for example, and the precipitate recovered is dried.

The next step of the process consists in subjecting the dried and mangostin-enriched extract to grinding to reduce it to a powder state.

The powder obtained is then poured into a vegetable oil or a synthetic ester, preferably at a weight fraction of 50%. The mixture obtained is designed to be part of a cosmetic composition in the form of a cream, using a weight fraction of 20%, for example.

To purify the mixture consisting of the oil or ester and the powder still more, the mangostin-rich fraction is separated from the powder, which is soluble in said oil or said ester, and from its residual impurities. According to one embodiment, the mixture is centrifuged so that the oil or ester in which the mangostin is dissolved is recovered in the upper part of the container used for this purpose, while the residual impurities are deposited on

the bottom of the c ntainer.

According to this example of embodiment, the result of the above is that the weight fraction of the mangostin powder in the cosmetic composition is 10%. This latter consists on the one hand of an oily phase preheated to about 80° which contains the mangostin fraction dissolved in the oil or ester, which is mixed with fatty substances and preservatives, and on the other hand of an aqueous phase preheated to the same temperature and mixed with the above, whereby said aqueous phase consists of a gel dispersed in water.

The formulation for the composition obtained is shown in Table 1 below.

TABLE 1. KEY: (a) constituents; (b) weight fraction, %; (c) cetyl alcohol; (d) ethylenediaminetetraacetic acid disodium salt (EDTA); (e) magnesium stearate; (f) PVP eicosen copolymer; (g) preservatives; (h) dissolved mangostin fraction; (i) total, oily phase; (j) demineralized water; (k) acrylic copolymer; and (l) total, aqueous phase.

(a) CONSTITUANTS	(b) FRACTION MASSIQUE (%)
(c) Alcool cétylique	0,5
(d) Acide tétra-acétique éthylène diamine (EDTA) dissodique	0,1
(e) Stéarate de magnésium	4,0
Dimethicone	0,5
(f) PVP eicosen copolymère	1,0
(g) Conservateurs	2,7
Dipropylène glycol (DPG)	1,0
Cétyl Phosphate	2,0
(h) Fraction de mangostine dissoute	20,0
(i) TOTAL PHASE HUILEUSE	31,3
(j) Eau déminéralisée	67,6
(k) acrylique copolymère	0,25
(l) TOTAL PHASE AQUEUSE	67,85
triéthanolamine (TEA)	0,35

Once the mixture of the oily phase and the aqueous phase is made, triethanolamine is added to adjust the pH of the cosmetic composition to a predeter-

mined value.

Various *in vitro* and *in vivo* tests were done to evaluate the protection factor of the composition with respect to ultraviolet radiation of type A (UVA) and type B (UVB).

The *in vitro* determination of the protection factor of the cosmetic composition with respect to ultraviolet radiation was done by spectrophotometry (method of Diffey and Robson). This method consists in measuring the transmission of ultraviolet radiation through an inert film which is coated with the composition according to the invention ("test" measurements) and comparing this transmission to that which passes through the same film coated with a control composition ("control" measurements). According to one example of embodiment, said control composition consists of the products listed in Table 1 above, except that the fraction of mangostin dissolved in vegetable oil or synthetic ester is replaced by that oil or that ester. For a detailed description of this method, refer to the following article: B. L. Diffey and J. Robson, "A new substrate to measure sunscreen protection factors throughout the ultraviolet spectrum", *J. Soc. Cosmet. Chem.*, Vol. 40, pp. 127-133, 1989.

First, we determined the protection factors of the control composition and the composition according to the invention separately with respect to each of the radiations, UVA and UVB. In a second phase, we used a correlation to deduce the overall protection factors characterizing said control composition and the composition according to the invention (see the above article for the correlation used).

We have reported the results obtained in Table 2 (each protection factor is given as an average value ± the standard deviation.

This experiment shows that the overall sun protection factor of the com-

position according to the invention is about 10.3.

TABLE 2. KEY: (a) measurements; (b) UVA protection factor; (c) UVB protection factor; (d) overall sun protection factor; (e) control; and (f) test.

Mesures (a)	Indice de protection contre les U. V. A. (b)	Indice de protection contre les U. V. B. (c)	Indice de protection solaire global (d)
(e) Témoin	1,5 ± 0,2	1,6 ± 0,1	1,6 ± 0,1
	1,3 ± 0,2	1,5 ± 0,1	1,5 ± 0,1
(f) Essai	3,2 ± 0,2	11,7 ± 3,8	10,2 ± 2,2
	3,2 ± 0,7	11,9 ± 2,6	10,4 ± 2,7

The in vivo determination of the sun protection factor of said cosmetic composition was done by means of a panel of six healthy adults 18 to 41 years of age, consisting of five women and one man. Two of these subjects had a class II phototype (blond hair, light skin, frequent actinic erythema, light tan), while the other four had a class III phototype (blond or brown hair, light skin, variable actinic erythema, light to moderate tan). These classes, which define the tendency for actinic erythema and the skin pigmentation of an individual, are taken from the phototype classification proposed by T. B. Fitzpatrick (refer to P. Thomas and J. P. Cesarini, "Phototypes", *Nouv. Dermatol.*, Vol. 3, No. 6, pp. 199-203, 1984).

In a first step, the skin on the back of each of these subjects was exposed to UVA and UVB radiation in order to determine for each person the minimum dose of light intensity which causes the appearance of a mild erythema or a perceptible redness without ambiguity, that is, with well-defined borders. This dose, or the minimum erythematous dose, will be designated by the abbreviation MED in the rest of the present specification.

As a guideline, the light source used was a 150 W xenon arc lamp with

filters. In addition, we used flexible light guides which make it possible to deliver progressive doses of light intensity to the skin of the subjects. The wavelength of the radiation emitted by the lamp was between 290 and 390 nm.

Determination of the MED was done using the colorimetric method described by Chardon et al., after definition of the skin type studied. For a detailed description of this method, refer to the following article: A. Chardon, L. Cretois, and C. Hourseau, "Skin color typology and suntanning pathway", *Int. J. Cosmet. Sci.*, Vol. 13, pp. 191-208, 1991.

In a second step, we applied the cosmetic composition according to the invention to part of the skin on the back of each subject, in the amount of approximately 2 mg/cm^2. Then that part of the skin which was coated with the composition was exposed to UVA and UVB radiation, about 15 minutes after the application of said composition and for a predetermined period of time as a function of the MED of each person.

In the same way and at the same time, the rest of the back, not coated with said composition, was exposed to the above-mentioned radiation.

We then did macroscopic skin examinations of the back of each subject, between 16 and 24 hours after exposure to said radiation, in order to determine the minimum light intensity which causes the appearance of redness on an area of skin which had or had not previously been coated with the composition of the invention ("MED with composition" and "MED without composition", respectively).

Finally, for each subject we evaluated the individual sun protection factor *in vivo* of the composition according to the invention by the so-called Schultze method, which consists in using the following relation: individual protection factor = MED with composition/MED without composition.

refer to the following works: *Federal Register*, August 25, 1978, Vol. 43, No. 166, pp. 38,206-38,269, and C.O.L.I.P. Task Force, "Sun Protection Measurement: SPF Test Method", 1992.

TABLE 3. KEY: (a) subject's phototype; (b) class .... ; (c) sun protection factor; and (d) (average ± standard deviation).

(a) Phototype de la personne	(c) Indice de protection solaire
(b) Classe II	8.96
Classe III	6.40
Classe III	8.94
Classe III	10.00
ClasseII	6.39
Classe III	8.00
	8.1 ± 1.3
	(d) (moyenne ± écart type)

The individual protection factors and the average protection factor for all six subjects are shown in Table 3.

The sun protection factor of 8.1 which was determined *in vivo* in subjects predisposed to sunburn thus confirms the value determined *in vitro*.

Consequently, the use of mangostin to develop a cosmetic composition makes it possible to obtain a high factor of protection against ultraviolet solar radiation.

We should mention that the efficacy of said composition is practically independent of its formulation, in contrast to the usual sunscreens of mineral origin.

We should also mention that the tests done *in vitro* with the composition according to the invention allow us to conclude the absence of a skin reaction due to intolerance to the test composition, contrary to what is sometimes observed when synthetic sunscreens are used which contain active ingredients

observed when synthetic sunscreens are used which contain active ingredients with a high degree of penetration into the skin.

CLAIM(S)

1. Process for the production of a cosmetic composition designed to protect the skin from the sun, characterized in that it consists essentially of extracting the mangostin-rich fraction from a part of a tree of the species *Garcinia mangostana*, solubilizing this fraction in an oily phase, and mixing this oily phase containing said fraction with an aqueous phase.

2. Process according to Claim 1, characterized in that it consists in using the fruit of said tree to extract said mangostin-rich fraction from it.

3. Process according to Claim 2, characterized in that it consists in using the husk and dried stalks of said fruit to extract said mangostin-rich fraction from it.

4. Process according to one of the preceding claims, characterized in that said step of extraction of the mangostin-rich fraction from said tree consists essentially in grinding said part of said tree, immersing it in a solvent designed to dissolve the mangostin which it contains, separating the mangostin dissolved in said solvent from said ground part, and evaporating said solvent so as to recover a dry mangostin extract.

5. Process according to Claim 4, characterized in that said extraction step also consists in precipitating said dry mangostin extract in an aqueous medium, and drying and grinding the precipitate obtained so as to obtain a powder still richer in mangostin.

6. Process according to Claim 4 or 5, characterized in that said mangostin powder is present is said cosmetic composition at a weight fraction of about 10%.

7. Cosmetic composition designed to protect the skin from the sun, characterized in that it contains mangostin.